Appl. No. 09/831,843
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Reply to Office Action of January 8, 2008

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

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Listing of Claims:

1. (currently amended) A method for using a computer processor to interpolatively code input waveform signals, in which said signals decomposed into or are composed of a slowly evolving waveform comprising inputting waveform signals to the computer and a step selected from the group consisting of:

(a) using the computer processor to perform analysis-by-synthesis quantization of the dispersion phase such that the linear shift phase attribute is reduced or eliminated from the quantization;

(b) using the computer processor to process a group of adjacent pitch values and weighting them to compute a weighted average in order to compute the most probable value of pitch ;

(c) using the computer processor to incorporate spectral and temporal pitch searching, such that the temporal searching is performed at a different rate than the spectral searching;

(d) using the computer processor to incorporate temporal weighting in the an analysis-by-synthesis vector-quantization of the gain sequence;

(e) using the computer processor to quantize adjacent values by analysis-by-synthesis vector-quantization without downsampling or interpolation of the gain values;

(f) using the computer processor to incorporate switch prediction or switched filtering in an analysis-by-synthesis vector-quantization of the gain sequence;

(g) using a coder in which a plurality of bits therein are allocated to the vector-quantization of the dispersion phase of the slowly evolving waveform phase from which the linear shift attribute was reduced or removed; and

(h) using the computer processor for pitch searching using varying boundaries of the summations used in computing the similarity or an equivalent distortion measure used for the pitch search.

2. (previously presented) The method of claim 1 in which said signal is representative of speech.

3. (previously presented) The method of claim 1 in which said method incorporates a plurality of steps (a) through (h).

4. (previously presented) The method of claim 1 further comprising the step of analysis-by-synthesis vector-quantization of the slowly evolving waveform, wherein distortion is reduced in the signal by obtaining the accumulated weighted distortion between a sequence of input waveforms and a sequence of quantized and interpolated waveforms.

5. (previously presented) The method of claim 1 further comprising providing at least one codebook containing magnitude and dispersion phase information for predetermined waveforms, and in which the step of analysis-by-synthesis quantization of the dispersion phase comprises approximately aligning the linear phase of one or the other of the input and output, then iteratively shifting the approximately aligned linear phase input or output, comparing the shifted input or output to a plurality of waveforms reconstructed from the magnitude and dispersion phase information contained in said at least one codebook, and selecting the reconstructed waveform that best matches one of the iteratively shifted inputs or outputs.

6. (previously presented) The method of claim 1 in which in the method of temporal pitch searching of step (d) comprises defining boundaries of segments of said summations used to compute similarity selecting the best boundary such that maximizing the similarity or minimizing the distortion measure by iteratively

shifting and changing the length of the segments used for the summations used in the measure computations.

7. (previously presented) The method of claim 1 in which the spectral pitch and temporal pitch searches are conducted.

8. (previously presented) The method of claim 1 in which the step of the temporal weighting in the analysis-by-synthesis vector-quantization of the signal gain sequence is changed as a function of time whereby to emphasize local high energy events in the input signal.

9. (previously presented) The method of claim 1, further comprising applying both high correlation and low correlation synthesis filters to a vector quantizer codebook in the analysis by synthesis vector quantization of the signal gain whereby to add self correlation to the codebook vectors, in which selection between the high and low correlation synthesis filters is made to maximize similarity between the input target gain vector and a reconstructed vector.

10. (previously presented) The method of claim 1 wherein each value of gain in the analysis-by-synthesis vector-quantization of the signal gain is used to obtain a plurality of shapes, each composed of a predetermined codebook having a number of entries, and comparing said shapes to an input target vector and selecting the reconstructed shape that maximizes the similarity to the input target vector.

11. (canceled)

12. (currently amended) A method for using a computer to quantize waveforms comprising:

inputting waveform signals to the computer, and

~~using~~ determining from said signals ~~the~~ an accumulated distortion between adjacent input waveforms and adjacent quantized and interpolated output waveforms ; and

generating a reconstructed waveform using said accumulated distortion ~~to quantize said waveforms~~.

13. (currently amended) A method for using a computer to interpolatively code input waveform signals ~~in which the signal decomposed into or composed of attributes or components one of which is a slowly evolving waveform, which has or from which one can extract dispersion phase,~~ comprising:

inputting waveform signals to the computer, ~~and~~

determining said slowly evolving waveform from said signals;

extracting a dispersion phase from said slowly evolving waveform; and

~~incorporating~~ performing an analysis-by-synthesis quantization of the dispersion phase.

14. (previously presented) The method of claim 13 further comprising:

providing at least one codebook containing magnitude and dispersion phase information for predetermined waveforms,

approximately aligning the linear phase of the input,

then iteratively shifting said approximately aligned linear phase input,

and/or comparing the shifted input, or equivalently shifting the quantized vector, to a plurality of vectors reconstructed from the magnitude and dispersion phase information contained in said at least one codebook, and

selecting the reconstructed vector that best matches the input vector or one of the iteratively shifted input vectors.

15. (currently amended) A method for using a computer processor to interpolatively code input waveform signals in which the signal decomposed into or composed of attributes or components one of which is a slowly evolving waveform, which has or from which one can extract dispersion phase, comprising:

inputting waveform signals to the computer and incorporating analysis-by-synthesis quantization of the dispersion phase,

including providing at least one codebook containing magnitude and dispersion phase information for predetermined waveforms, crudely aligning ~~the~~ a linear phase of the input vector, then iteratively shifting said crudely aligned linear phase input vector, and/or comparing the iteratively shifted input vector, or equivalently shifting ~~the~~ a quantized vector, to a plurality of vectors reconstructed from the magnitude and dispersion phase information contained in said at least one codebook, and selecting the reconstructed vector that best matches the input vector or one of the iteratively shifted input vectors, in which a distortion measure for a given data vector is determined by a perceptually weighted average of distortion measures for harmonics of the given data vector wherein the perceptual weighting combines a spectral-weighting and synthesis and in which ~~the~~ an average global distortion measure for a particular vector set M is an average of distortion measures for the data vectors in M

and including the step of minimizing the global distortion thereof by using a centroid formula to determine phases of harmonics.

16. (previously presented) The method of claim 15, wherein the centroid formula uses both input and quantized slowly evolving waveform coefficients.

17. (currently amended) A method for using a computer to interpolatively code input waveform signals, comprising:

inputting waveform signals to the computer ~~and~~

performing ~~using~~ spectral and temporal pitch searches on said signals,

~~computing~~ determining a number of adjacent pitch values, and

computing ~~the~~ a most probable pitch value by computing the weighted average pitch value.

18. (previously presented) The method of claim 17 in which in the method of searching the temporal domain pitch comprises

defining a boundary for a segment used for the summations in the computed measure used for the pitch search, and

selecting the boundaries of the segment that maximize the similarity or minimize the distortion measure used for the pitch search, by iteratively shifting and expanding the segment.

19. (currently amended) A method for using a computer to interpolatively code input waveform signals comprising:

inputting waveform signals to the computer ~~and~~

~~using~~ performing spectral and temporal pitch searches to lock onto a most probable pitch period of the signal,

~~computing~~ determining a number of adjacent pitch values, and

then computing the most probable pitch value by computing a weighted average pitch value in which in the method of searching the temporal pitch is based on harmonic matching using varying segment boundaries.

20. (currently amended) A method of using a computer to interpolatively code input waveform signals comprising

inputting waveform signals to a computer

~~and~~ using a weighted average using normalized correlations for weights to compute one pitch value out of a set of pitch values of the waveform signal ; and

using the pitch value to regenerate a reconstructed waveform.

21. (currently amended) The method of claim 19 in which the performing spectral domain pitch and temporal domain pitch searches ~~in said step of locking onto the most probable pitch period of the signals~~ are conducted respectively at 100 Hz and 500 Hz.

22. (currently amended) A method for using a computer to interpolatively code input waveform signals ~~using a computer to perform vector quantization of a waveform signal gain sequence~~, comprising:

inputting waveform signals to the computer and

~~using~~ performing analysis-by-synthesis vector quantization of the gain sequence of the waveform,

regenerating an output signal using said gain sequence.

23. (previously presented) The method of claim 22 including using temporal weighting, and in which the temporal weighting is changed as a function of time whereby to emphasize local high energy events in the input signal.

24. (currently amended) The method of claim ~~22~~ 23, comprising applying synthesis filter or predictor, which introduces selected high correlation or low correlation to a vector quantizer codebook in the analysis-by-synthesis vector-quantization of the signal gain sequence to add selected self correlation to the codebook vectors.

25. (currently amended) The method of claim 24 in which selection between the high and low correlation synthesis filters or predictor is made to maximize similarity between ~~the~~ signal ~~vector~~ and ~~a~~ reconstructed ~~vector~~ vectors.

26. (previously presented) The method of claim 22, comprising using each value of gain index in the analysis-by-synthesis vector-quantization of the signal gain.

27. (previously presented) The method of claim 22 wherein each value of gain index is used to select from a plurality of shapes and associated predictors or filters, each of which is used to generate an output shape vector, and comparing the output shape vector to an input shape vector.

28. (previously presented) The method of claim 27 in which said plurality of shapes has a predetermined number of values in the range of 2 to 50.

29. (previously presented) The method of claim 27 in which said plurality of shapes has a predetermined number of values in the range of 5 to 20.

30. (currently amended) A method for using a computer to interpolatively code input waveform signals ~~in which said signals decomposed into or are composed of a slowly evolving waveform and other attributes or components~~, comprising:

inputting waveform signals to the computer

decomposing said signal into a slowly evolving waveform, and

using a coder in which a plurality of bits therein are allocated to the vector-quantization of ~~the~~ a dispersion phase of the slowly evolving waveform phase from which the linear shift attribute was reduced or removed.

31. (previously presented) The method of claim 30 in which at least one bit is allocated to the dispersion phase.

32. (currently amended) A method for using a computer to interpolatively code input waveform signals comprising:

inputting waveform signals to a computer; and

using at least one processor of the computer to:

determine input vectors representing the waveform signals;

determine interpolated vectors for modeling the input vectors;

compute ~~the~~ an accumulated weighted distortion between the input vectors and the interpolated vectors as a sum of a modeling distortion and a quantization distortion; and

determine an optimal vector which minimizes the modeling distortion.

33. (previously presented) The method of claim 32 further comprising: using at least one processor of the computer to determine a respective quantized vector using the optimal vector.

34. (previously presented) The method of claim 17 in which the step of computing a number of adjacent pitch values includes some weight associated with their probability , and using normalized autocorrelations obtained for each pitch value, or

some function of autocorrelation, as its associated probability weight used to compute the weighted average pitch value.

35. (previously presented) The method of claim 12 including using accumulated spectrally weighted distortion.

36. (previously presented) The method of claim 22 including using a switch predictive synthesis filter or predictor.